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C2, A New Mosaic Resistant Connecticut Broadleaf Tobacco

A variety of Connecticut Broadleaf tobacco resistant to tobacco mosaic virus has been developed at The Connecticut Agricultural Experiment Station. This variety, C2, has given yields about 25 per cent superior to our standard Kupchunos Broadleaf with sorting quality essentially equal to Kupchunos. C2, therefore, promises a decrease in the cost of production per pound of tobacco in larger scale tests. Limited quantities of seed are available for trial by growers.

The mosaic resistance in our material derives originally from *Nicotiana glutinosa*. This species contains a dominant gene for resistance which has been transferred to *Nicotiana tabacum* by interspecific hybridization.

Plants containing the gene for glutinosa type resistance are actually hypersensitive to the tobacco mosaic virus and develop a small necrotic spot at the point of infection. This dead tissue prevents the normal spread of the virus throughout the plant. Furthermore, even though such plants may be infected and show a few inconspicuous local lesions, the mosaic virus cannot be passed from them to other plants by contact. These two factors make the glutinosa form of resistance highly effective in the field.

The Connecticut pedigrees containing the introduced gene trace to W. D. Valleau's variety Kentucky NN. This was a true-breeding mosaic resistant dark fire-cured line, designated by Valleau as an F_4 selection following the crosses (NN Brown Leaf x T.I. 87) x NN Brown Leaf. Work on this mosaic resistance breeding was begun at the Windsor Tobacco Laboratory in 1948 by P. J. Anderson. The project was continued by E. L. Petersen and later has been carried to its current stage by the present authors.

The original cross between Kentucky NN and Hartman Broadleaf was followed by two additional crosses with Hartman Broadleaf and two successive crosses with Kupchunos Broadleaf. Subsequently the C2 line

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Figure 1. C2 Mosaic Resistant Broadleaf. Typical lower, middle, and upper leaves (left to right) from the 5th, 9th, and 17th node positions.

Figure 2. Kupchunos Broadleaf. Typical lower, middle, and upper leaves (left to right) from the 5th, 9th, and 14th node positions.

has been inbred by self-pollination since 1951. Throughout the program parental plants have been selected in the field each generation for mosaic resistance and for Broadleaf characters. More than 200 different families have been grown and tested since 1948. Our procedure has been to make final selection among the experimental families on the basis of sorting quality of samples of their cured leaves in comparison with the standard variety, Kupchunos Broadleaf.

The C2 selection has bred true for mosaic resistance since 1953. Its 1960 families represent the 9th inbred generation following five crosses with Connecticut Broadleaf. As a result of these crosses with Broadleaf, the genetic background of C2 is expected to be about 75 per cent Kupchunos Broadleaf, 22 per cent Hartman Broadleaf, and 3 per cent Kentucky NN. Thus, C2 may be considered a conventional Connecticut Broadleaf type possessing genetic resistance to tobacco mosaic virus.

Figure 1 shows typical lower, middle, and upper leaves of C2 Broadleaf. These may be compared with leaves of a standard Connecticut Broadleaf variety, Kupchunos, shown in Figure 2. Mature plants of the two varieties along with an experimental strain of wildfire resistant Broadleaf are pictured in Figure 3.

Table 1 summarizes the high-yielding performance of C2 in comparison with Kupchunos grown under the same conditions, as estimated from fresh leaf samples. The leaves greater than six inches long on the main stalk were picked from individual plants, counted, and immediately weighed as a group. The average fresh weight per leaf was calculated by dividing the average total weight of leaves per plant by the average number of leaves per plant. For each of four years tests the results are expressed

Figure 3. Mature plants, showing habit of growth. Left to right: Kupchunos Broadleaf, C2 Mosaic Resistant Broadleaf, and a wildfire resistant Broadleaf strain.

Table 1. Fresh leaf yield of C2 mosaic resistant Connecticut Broadleaf compared during four years with Kupchunos Broadleaf

C2 family	Number of plants sampled	Percentage of Kupchunos control		
		Average fresh weight leaf yield per plant	Average number of leaves per plant	Average fresh weight per leaf
5789	5	151	98	155
587	5	131	108	121
5917	6	105	108	98
6012	6	126	105	119
Average	22	128	105	123

for C2 as a percentage of the value obtained for Kupchunos the same year. Thus, the comparable Kupchunos value in each case is 100 per cent. It can be seen that the average fresh weight yield per C2 plant exceeded that for Kupchunos each year, with the four-year average yield 28 per cent greater for C2. The data indicate that this greater yield is partly due to more leaves per plant but is principally due to greater average weight per leaf.

Table 2 summarizes data comparing C2 with Kupchunos Broadleaf on the basis of cured leaf samples from three harvest years. In these tests the sampling units were not individual plants, but groups of five plants cured on the same lath. The leaf samples under code number were counted and weighed after sorting into conventional quality grades. The yield averages and grade quality indices were then calculated, and are presented for C2 as a percentage of comparable values obtained for Kupchunos. These results for cured leaves give an average yield 26 per cent greater for C2, due to both more and larger leaves. In addition our data indicate that the average sorting quality of C2 is not inferior to Kupchunos, and is probably slightly superior as evaluated under our conditions.

Our yield tests have been conducted on plants not infected with tobacco mosaic virus. Where mosaic is present the advantage of C2 should be greater. The gain in yield shown in our relatively small tests should be realized on a larger scale as well, and contribute to a decrease in the cost of production per pound of tobacco.

Table 2. Cured leaf yield and sorting quality of C2 mosaic resistant Connecticut Broadleaf compared during three years with Kupchunos Broadleaf

C2 family	Number of plants sampled	Percentage of Kupchunos control			
		Average weight leaf yield per plant	Average leaf number per plant	Average weight per leaf	Average sorting quality
56124	30	116	96	121	104
5788	15	113	95	119	103
5914	20	132	116	114	101
5916	20	132	126	110	104
5917	20	135	111	117	100
5918	20	133	114	116	96
Average	125	126	110	116	101